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**XIII. Account of the Black Canker Caterpillar, which destroys the Turnips in Norfolk. By William Marshall, Esq. in a Letter to Charles Morton, M. D. F. R. S.**

Read February 8, 1783.

S I R,

Gunton, near Aylsham, Norfolk,  
August 22, 1782.

A FEW months after you did me the honour of presenting my minutes of agriculture to the British Museum, I came down into Norfolk, as agent to Sir HARBORD HARBORD.

To a person intelligent in matters of agriculture it would be superfluous to say, that Norfolk is celebrated for good husbandmen; or that the turnip crop is the basis of the Norfolk husbandry. If a Norfolk farmer loses his crop of turnips, his farm is injured for several succeeding years; for it is not only the loss of the immediate profit, which would otherwise have arisen to him from his bullocks, but his land is deprived of the consequent manure and trampling (esteemed highly beneficial to the light lands of this county) on which his future crops of corn are essentially dependant.

Among the numerous enemies to which turnips are liable, none have proved more fatal here than the Black Canker (a species of Caterpillar) which in some years have been so numerous as to cut off the farmer's hopes in a few days. In other years, however, the damage has been little, and in others nothing. About twenty years ago the whole country

was nearly stripped; and this year it has been subjected to a similar fate. Many thousands of acres, upon which a fairer prospect for a crop of turnips has not been seen for many years, have been plowed up; and as, from the season being now far spent, little profit can be expected from a second sowing; the loss to the farmers, individually, will be very considerable, and to the county immense.

It was observed in the canker-year above mentioned, that, prior to the appearance of the caterpillars, great numbers of yellow flies were seen busy among the turnip plants; and it was then suspected, that the canker was the caterpillar state of the yellow fly; and since that time it has been remarked, that cankers have regularly followed the appearance of these flies. From their more frequently appearing on the sea-coast, and from the vast quantities which have, I believe, at different times, been observed on the beach washed up by the tide, it has been a received opinion among the farmers, that they are not natives of this country, but come across the ocean, and observations this year greatly corroborate the idea. Fishermen upon the eastern coast declare, that they actually saw them arrive in cloud-like flights; and from the testimony of many, it seems to be an indisputable fact, that they first made their appearance on the eastern coast; and, moreover, that on their first being observed, they lay upon and near the cliffs so thick and so languid, that they might have been collected into heaps, lying, it is said, in some places two inches thick. From thence they proceeded into the country, and even at the distance of three or four miles from the coast they were seen in multitudes resembling swarms of bees. About ten days after the appearance of the flies, the young caterpillars were first observed on the under sides of the leaves of the turnips, and in  
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seven or eight days more, the entire plants, except the stronger fibres, were eaten up. A border under the hedge was regularly spared until the body of the inclosure was finished; but this done, the border was soon stripped, and the gateway, and even the roads have been seen covered with caterpillars travelling in quest of a fresh supply of turnips; for the grasses, and indeed every plant, except the turnip and the charlock (*sinapis arvensis*) they entirely neglect, and even die at their roots, without attempting to feed upon them. This destruction has not been confined within a few miles of the eastern coast, but has reached, more or less, into the very center of the county. The mischief, however, in the western parts of Norfolk, and even on the north coast, has been less general; but I am afraid it may be said, with a great deal of truth, that one half of the turnips in the county have been cut off by this voracious animal.

A circumstance so discouraging to industry, and injurious to the public at large, will, I flatter myself, Sir, be thought a sufficient apology for my troubling you with a relation of it, and for my taking the liberty of sending you a male and a female fly, also one of the animals in its caterpillar, and one which is in its chrysalis state, for your inspection, hoping that the public may become acquainted with the means of preventing in future so great a calamity.

Lest the flies may become disfigured in travelling, it may be prudent to say, that their wings are four; that their antennæ are clubbed, and about one-third of the length of their body, each being composed of nine joints, namely, two next the head, above which two there is a joint somewhat longer than the rest, and above this six more joints, similar to the two below; that near the point of the tail of the female there is a

black speck, outwardly fringed with hair; but which, opening longitudinally, appears to be the end of a case, containing a delicate point or sting (about one-twentieth of an inch in length) which on a cursory view appears to be a simple lanceolated instrument, with a strong line passing down the middle, and ferrated at its edges; but, on a closer inspection, and by agitating it strongly with the point of a needle, it separates into three one-edged instruments, hanger-like as to their general form, with a spiral line or wrinkle winding from the point to the base, making ten or twelve revolutions, which line, passing over their edges, gives them some appearance of being ferrated.

By the help of these instruments, I apprehend, the female deposits her eggs in the edge of the turnip-leaf (or sometimes, perhaps, in the nerves or ribs on the under surface of the leaf); thus far I can say, and I think with a considerable degree of certainty, that having put some fresh turnip leaves into a glass containing several of the male and female flies, I perceived (by the means of a simple magnifier) that one of the females, after examining attentively the edge of the leaf, and finding a part which appeared to me to have been bitten, unsheathed her instruments, insinuated them into the edge of the leaf, and having forced them asunder so as to open a pipe or channel between them, placed her pubes (the situation of which from repeated and almost incessant copulations I had been able to ascertain precisely, and to the lower part of which these instruments seem to be fixed) to the orifice, and having remained a few seconds in that posture, deliberately drew out the instruments (which the transparency of the leaf held against a strong light afforded me an opportunity of seeing very plainly) and proceeded to search for another convenient place for her purpose.

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The caterpillar has twenty feet (six of its legs being of considerable length, the other fourteen very short) and in its first stage is of a jetty black, smooth as to a privation of hair, but covered with innumerable wrinkles. Having acquired its full size, it fixes its hinder parts firmly to the leaf of a turnip, or any other substance, and breaking its outer coat or slough near the head, crawls out, leaving the skin fixed to the leaf, &c. The under coat, which it now appears in, is of a blueish or lead colour, and the caterpillar is evidently diminished in its size. In every respect it is the same animal as before, and continues to feed on the turnips for some days longer : it then entirely leaves off eating, and becomes covered with a dewy moisture, which seems to exude from it in great abundance, and appearing to be of a glutinous nature, retains any loose or pliant substance which happens to come in contact with it, and by this means alone seems to form its chrysalis coat. One I find laid up in the fold of a withered turnip leaf (that which I have the honour of inclosing you) was, among six others, formed by putting common garden mould to them while they were in the exsudatory state above described.

From the generic characters of the fly I conclude it to be a *Tenthredo* of HILL ; but whether that voluminous author be sufficiently accurate ; or whether, from being an almost entire stranger to natural history, I may, or may not, sufficiently understand my book, I must beg leave to submit to your superior knowledge of the subject.

I am endeavouring to extend my observations on these insects, and am making some experiments concerning them, the result of which I should be extremely happy in being permitted to communicate to you ; and it may be proper to add here, that

I should not have taken the liberty of troubling you prematurely with this letter, had I not luckily met with an opportunity of procuring some live flies (which are now become very scarce) ; and I flatter myself they will come to your hands in a perfect state.

I am, with the greatest respect, &c.

